

What is claimed is:

1. A perpendicular magnetic recording medium, comprising:
a hard magnetic recording layer;
a soft magnetic layer; and
a non-magnetic intermediate layer between the hard magnetic recording layer and the soft magnetic layer, the hard magnetic recording layer comprising:
an hcp-structured layer; and
a Co-alloy layer comprised of either a Co_3Pt -alloy layer or an hcp CoPt -based alloy layer positioned adjacent to the hcp-structured layer.
2. The recording medium of claim 1, wherein the hcp-structured layer comprises CoPtXY , where X is a grain-refining material, and Y is an element selected from the group consisting of: Ta, Cr, Nb, Mo, Si, and Ge.
3. The recording medium of claim 2, wherein the grain-refining material comprises a material selected from the group of: B, C, Zr, and Hf.
4. The recording medium of claim 2, wherein the grain-refining material comprises an oxide.
5. The recording medium of claim 4, wherein the grain-refining material comprises a material selected from the group of: SiO_2 , Al_2O_3 , CoO , CrO_2 , and NiO_2 .
6. The recording medium of claim 1, wherein non-magnetic intermediate layer comprises:
a seedlayer; and
an underlayer positioned adjacent to the seedlayer.
7. The recording medium of claim 6, wherein the underlayer comprises:
an hcp material.
8. The recording medium of claim 1, wherein the Co-alloy layer comprises:
a Co_3Pt phased material.

9. The recording medium of claim 8, wherein the Co_3Pt phased material comprises:

a $(\text{CoCr})_3\text{Pt}$ alloy.

10. The recording medium of claim 8, wherein the Co_3Pt phased material comprises:

a Co_3Pt -based alloy including one or more of: Ta, B, Cr, Nb, Mo, Si, Ge.

11. A magnetic disc drive storage system, comprising:

a magnetic recording head having an air bearing surface; and

a perpendicular magnetic recording medium positioned adjacent the air bearing surface of the magnetic recording head;

the perpendicular magnetic recording medium comprising a hard magnetic recording layer, a soft magnetic layer, and a non-magnetic intermediate layer between the hard magnetic recording layer and the soft magnetic layer, and the hard magnetic recording layer comprising an hcp-structured layer, and a Co-alloy layer comprised of either a Co_3Pt -alloy layer or an hcp CoPt -based alloy layer positioned adjacent to the hcp-structured layer.

12. The system of claim 11, wherein the hcp-structured layer comprises CoPtXY , where X is a grain-refining material, and Y is an element selected from the group consisting of: Ta, Cr, Nb, Mo, Si, and Ge.

13. The system of claim 12, wherein the grain-refining material comprises a material selected from the group of: B, C, Zr, and Hf.

14. The system of claim 12, wherein the grain-refining material comprises an oxide.

15. The system of claim 14, wherein the grain-refining material comprises a material selected from the group of: SiO_2 , Al_2O_3 , CoO , CrO_2 , and NiO_2 .

16. The system of claim 11, wherein non-magnetic intermediate layer comprises:

a seedlayer; and

an underlayer positioned adjacent to the seedlayer.

17. The system of claim 16, wherein the underlayer comprises:

an hcp material.

18. The system of claim 11, wherein the Co-alloy layer comprises:
a Co_3Pt phased material.

19. The system of claim 18, wherein the Co_3Pt phased material
comprises:
a $(\text{CoCr})_3\text{Pt}$ alloy.

20. The system of claim 18, wherein the Co_3Pt phased material
comprises:
a Co_3Pt -based alloy including one or more of: Ta, B, Cr, Nb, Mo, Si, Ge.